THE EFFICIENCY MOVEMENT IN ITS RELATION TO AGRICULTURE

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Branches of Agricultural Science

During the past century dozens of new sciences have sprung up in connection with agriculture, but these can be grouped into three general classes.

First we have the technique of production, involving many recently developed sciences, such as agronomy, soils, plant physiology, genetics, animal husbandry, dairy husbandry, technical dairying, etc. The large number of new sciences in this phase of agriculture is indicative of the enormous amount of money and time that has been given to this phase of our fundamental industry.

The second general branch of agriculture relates to the economics of production. This branch of science is generally termed farm management. It is very new and as yet poorly developed, though considerable progress has been made within the last decade in the discovery and application of its principles.

The last general phase of agriculture relates to the distribution of agricultural products from the farm to the consumer. Its various phases are comprehended under the one general term marketing. The importance of this branch of agriculture has always been recognized, but it is only in very recent years that it has been given serious consideration by the agricultural authorities of the country. It is the most complex and most difficult branch of agriculture. Its possibilities are greatly overrated by many enthusiasts and are perhaps not fully understood by any of us.

Take, for instance, a crop like apples. One even hears the remark that there is no such thing as overproduction; the trouble is underconsumption. The apple crop occupies less than 1 per cent of our crop area in this country, and there is probably fifty times as much, more or less, adapted to this crop not now devoted to it; yet at the present time enormously more apples are produced than can

find a market, and the business is temporarily distinctly unprofitable. It is hardly probable that any one would be bold enough to claim that if the marketing of apples could be simplified and the cost reduced to a minimum that this crop, which when prices are good is distinctly profitable, would be in no danger of overproduction. Experience clearly shows that in the case of all those crops that occupy a small acreage but which at times bring a very large income per acre, if anything happens which broadens the market or in any way increases the profit, the room for expansion is so great that in a very short period overproduction is brought about again. If we had the most perfect system of marketing for all perishable products, so that the difference between the price received by the producer and that paid by the consumer became very small, in a few years production would expand until the price received by the farmer would be reduced to its present level, which, on the average for a long series of years, is just about the cost of production. A little familiarity with the history of prices and production of any of these intensive crops will convince anyone of the truth of this statement. But if the cost of distribution be reduced and production expands until the producer is in the same position he now occupies, the consumer would benefit greatly, because he would be getting practically all of the saving from our present wasteful methods of distribution. This makes it highly desirable that systems of marketing be developed that are as efficient as possible. These systems will temporarily benefit the farmer; ultimately, however, the benefit will go entirely to the consumer.

ECONOMICS OF PRODUCTION

Farm Management. The subject of farm management deals with the profits made by the farmer and the various principles involved in making these profits, or the factors which affect profits. The study of this science has shown clearly that any attempt to stimulate production beyond legitimate demand is ruinous to the farmer. It can benefit the public only temporarily, and that at the expense of the farmer. The ideal is to increase production as rapidly as is consistent with profit in production.

There are two factors governing the rate at which increased production has an economic justification. One is increase in demand. This comes about from growth in population, and from the cheapen-

ing of farm products to the consumer, which latter can be accomplished by better systems of marketing. Both of these will permit increase in production without ruinous decrease in price.

The second factor involved is the cost of production. If this can be reduced, then the price at which the farmer can sell with profit will be lowered, and the resulting increased demand will justify increase in production. Perhaps this point may be made clearer by considering its application to other industries. Take coal mining, for example. Suppose that by greater efficiency the annual output of coal were doubled in a short time. Supply would exceed demand, and prices would fall probably far below even the new low level of cost of production. This in turn would automatically reduce production. Approximate equilibrium would ultimately be reached between production and consumption at price levels below those formerly prevailing. Consider also the application of this principle to the great steel plants of the country. If these steel plants were to produce twice their present product, assuming the same kind of competition between steel plants that exists between farmers, the price of manufactured steel would fall. With an increase of 100 per cent in production without a corresponding increase in demand the price would fall to a ruinous point. As a result of these low prices consumption would probably increase, but the price under competition would fall back to the point where the plants would be making only a reasonable profit. This principle applies everywhere where there is free competition and unlimited production. These conditions obtain in agriculture, and anyone who discusses agricultural subjects without taking these conditions into consideration will be led into serious error.

But let us see what service the new science of farm management can render to the farmer and to the public in general. As stated above, this science deals with the economic factors which affect the profits in farming.

Types of Farming. The first and most important of these factors is the type of farming. If a farmer makes a mistake in selecting the various enterprises on which to base the business of his farm, especially if this mistake be a radical one, the resulting effect on his business is so overwhelming that he soon is either driven out of business or compelled to change his type of farming. For this reason in all those sections where agriculture has been long estab-

lished and where economic forces have had ample time to produce their legitimate effect, we find very few serious mistakes in type of farming. Thus, in one of our farm management surveys in a locality near the Atlantic seaboard, where farming has been in progress for more than two centuries, we found only one case of a gross mistake in type of farming. The region is one very poorly adapted to fruit. This particular farmer had planted two-thirds of his land in apple trees. He lacked $750 of having enough to pay interest on his investment, and as the interest on investment was less than this he actually had an income too small to pay his running expenses. It is inevitable that this farmer must ultimately fail.

But in the West and in certain sections of the South, where agriculture is developing on land recently brought under cultivation, mistakes of this kind are frequently met. A very large proportion of the real estate promotion schemes on the irrigated lands in the West have been based on the utterly false assumption that merely because the climate and soil were adapted to fruits and vegetables, the most intensive kinds of farming, it was possible for all this land to be devoted to this intensive farming. As a result of this egregious error thousands of men have lost their savings by undertaking types of farming utterly unadapted to local economic conditions. That is, there were no markets for their products. Combined with this mistake, and in reality as a result of it, the area of the farms has been made in many cases entirely too small to permit success with types of farming that are adapted to local economic conditions. Not only that, but the prices these men have paid to real estate speculators for their land are such that no type of farming can be made continuously profitable upon the land.

Even in the older parts of the country the science of farm management can render farmers an important service in connection with their types of farming. Thus, in a given region, where a farm management survey was conducted, three-fourths of the farms are dairy farms. Most of the remainder are hay farms. A few instances were found where the major source of income is poultry, or potatoes, or wheat, or several of these enterprises. A careful analysis of the business of some five hundred farms in this locality shows plainly that certain types of farming which are found on a few farms are quite poorly adapted to the region. When the results of this survey are published it will show those farmers who are engaged in

the types of farming most profitable for the region that they are right, and will thus tend to keep them right. It will show those who are engaged in wrong types the change they should make in their system. That is, it will benefit a small number of people by showing them the changes they should make in their types of farming and it will benefit a larger number by showing them that they are on the right road and should stay there.

Magnitude of the Farm Business. One of the most important lessons that the study of the science of farm management has emphasized is the relation between the magnitude of the farm business and the profit made by the farmer. The "little farm well tilled" has been lauded in this country since agriculture first became established. The farms in the Atlantic coast states were established at a time when the family farm was necessarily small because of the lack of labor-saving implements. The owners of these small farms produced nearly everything they needed in the way of food and clothing. They naturally produced a very small surplus, which went to feed the cities. Under these conditions only a small proportion of the population could live in cities because the surplus of farm products over and above the needs of farm families was so small. But about the time when emigration began to flow over the Alleghany Mountains and spread out in the broad Mississippi Valley, covering one of the most extensive and most fertile agricultural regions in the world, improved farm machinery began to be invented. This permitted a farm family to farm a much larger area of land.

The effect of this migration into the Mississippi Valley and the development of more efficient farming with labor-saving implements was overwhelming on the small farms of the Atlantic coast. The period between 1840 and 1850 witnessed the most tremendous revolution in agriculture in the Atlantic coast states that has ever occurred in this country. A small hint of the disaster which overtook eastern farmers during that decade is seen in the following facts. In Chester county, Pennsylvania, which at that time was one of the leading agricultural counties of the country—and which still maintains preëminence as a farming region—the number of swine fell from 65,000 in 1840 to 36,000 in 1850. These small Chester county farms, on which it was not practicable to use the more modern methods of crop production, found themselves poorly prepared to compete in swine production with the large farms of the

West. The disaster to the sheep industry was much more marked, the numbers having fallen during the decade from 56,000 to 13,000. At the beginning of this decade the production of beef was perhaps the most important phase of agriculture in Chester county. In the beginning of the decade there were 39,000 beef cattle in the county. Competition with the West reduced this number rapidly, and the reduction continued until 1890, when only 11,000 head of these cattle remained in the county. Practically the only livestock industry left to these farmers was dairying, and it is a bitter pill to the stockmen whose business has been based upon beef cattle, swine and sheep to descend to the continuous and laborious work of caring for dairy cows and their products. In 1840 there were 16,000 dairy cows in Chester county, Pennsylvania; in 1890 there were 49,000, and dairy products now constitute by far the most important source of income in the county. The small farms in the region could be converted into modern family farms only by some such intensive type of farming as dairying, as they are not adapted to fruit and vegetables.

What has been said above applies practically to the whole North Atlantic coast. Small farms still predominate in that region, but the reasons are at least partly historical, and not wholly economic. In the West, which was settled up after labor-saving machinery had been generally introduced, these small farms are few in number and are gradually disappearing to make place for the more effective large farm. In general, farm management investigations have demonstrated that the smallest effective area for a farm is that which will give constant employment at productive labor to the average farm family. It may be any amount larger than this, provided the farmer himself is capable of managing to advantage a larger amount of labor. In localities where good markets are available for the products of intensive farming, relatively small areas of land may be made to support an intensive business which in actual magnitude is equal to the business of the large farms of the Middle West. But when a real estate promoter undertakes to transplant this intensive farming to small patches of land a thousand miles from any possible market, he is doing a gross injustice to his patrons.

Quality of Business. The third most important factor affecting farm profits relates to the quality or the general efficiency of the

business. First we may consider the yield of crops. Farm management surveys have shown that, on the average, the higher the yield of crops the more profit the farmer makes, though there appears to be a very distinct limit in this direction. If the land is poor and yields are very low, they can be increased markedly with relatively small expenditure. But after yields of medium magnitude have been attained further increase is more expensive, and it not infrequently occurs that farmers with moderate yields make more profit than those who produce much larger yields. In general, however, those who get at least moderate yields nearly always make more profit than those who have low yields. The most important factor in the yield of crops is the character of the soil itself, and the farmer has very little control over this; but tillage and the use of manure and fertilizers are factors which are completely under the farmer's control. He can also increase his yields considerably by careful attention to the kind of seed he plants and by such modifications of his rotation or of his cropping system as will give the best adjustment between the kind of crop and the character of the soil, for distinctly different types of soil frequently have marked differences in crop adaptability.

In the case of a dairy farmer the income per cow is a very important measure of the quality of his business. In one of our farm management surveys a large number of farmers had receipts of less than fifty dollars per head from their cows. When these farmers were grouped according to number of cows, it was found that the more cows the farmer had the smaller were his profits. But in the same region were a considerable number of farmers who received an income of over a hundred dollars per cow, and in this group the larger the herd, the greater the profit. It has been conclusively proved in farm management surveys that one of the most important problems in any dairy region is that of breeding up the herd for greater production.

In the case of those farm products which reach the consumer in the same form they leave the farmer, as is the case with fruits and vegetables, the method of preparing the products for market, the kind of containers, the method of arranging the product in the containers—in fact, all those factors which affect the appearance of the produce when exposed for sale to the consumer,—have a very distinct relation to the farmer's profit.

A very remarkable illustration of this fact occurred a few years ago in St. Louis. At the height of the season for peaches the market was utterly glutted and the price was far below even the amount of transportation charges. One could go along the principal market streets and buy any amount of peaches for ten cents a crate. The owners of a large peach orchard in southern Missouri during this period made a special effort to make their fruit look attractive. The crates they used were made of the cleanest lumber obtainable. Every peach that was not entirely fancy in quality was thrown out, and before packing each peach was wrapped in a clean, crisp paper wrapper, with advertising matter neatly printed on it. When these peaches reached the St. Louis market and were exposed for sale beside other fruit which could be had for almost nothing, purchasers who passed along and saw this fine fruit would ask "How much"? "One dollar and sixty cents a crate," was the merchant's reply, to which the customer would usually respond: "Send me up a crate of these." Purchasers did not even ask the price of the less attractive fruit. They had found what they wanted and were willing to pay the price for it. It is in the most intensive types of farming that this matter of the appearance of the product in the market becomes of supreme importance.

Organization of the Farm Business. It is in the organization of the farm business that the principles which have been so highly developed in connection with the recent efficiency movement in the industrial world have their widest application. Volumes could be written without exhausting the subject of farm organization. Space permits only a few illustrations.

In the heart of the corn belt about fifty per cent of the land is in corn, about twenty-five per cent in oats, fifteen per cent in clover, and the remainder in a miscellaneous assortment of crops. Corn and oats thus occupy seventy-five per cent of the land. Now it happens that both of these crops require their maximum amount of work in early spring. After the spring rush is over oats require no further attention until harvest time, which comes just about the time the corn ought to be cultivated for the last time. Then after the corn cultivation is finished and the oat crop is harvested, there is practically nothing to do on these farms until it comes time to husk corn late in the fall. When the corn is husked, there is a long idle period during the winter.

In order to meet the tremendous rush of work in the early spring it is necessary for the farmer to have about one horse for every twelve to fifteen acres of land he has in cultivation. On a particular farm in Illinois, on which one hundred and seventy-five acres of land were in cultivation, twelve work horses were used for two months in the spring. Outside of these two months there is not a time of the year when more than five horses are needed, and except for about five months two horses would do the entire work on this farm. Now it costs approximately $100 a year to maintain a horse in that region. But since horses cannot be hired when they are needed, it is necessary for this farmer to keep twelve horses the year round. A careful study of his system resulted in the formulation of a new system which spread his field work quite evenly over the period from early spring till late fall and enabled four horses to do the work without ever being rushed. Assuming that an extra horse is kept for emergencies, this new system represents a saving in feed and other expenses of seven horses, amounting to, say, $700 a year, with a corresponding saving in horse-drawn implements. This represents approximately the saving that could be made by better farm organization throughout a large area in the central portion of the corn belt.

The problem of farm organization in the cotton belt presents some very interesting phases. Taking the cotton belt as a whole, a single farm family can manage about fifteen acres of cotton and ten acres of corn. One horse can do the work on such a farm. This is the reason for the general prevalence of the one-horse farms in the South. But when a man is following a single six hundred-pound mule across a field he is not earning much for himself or for anyone else. Studies of the problems of farm organization in the South have resulted in evolving systems of farming which will permit the average farm family to produce as much cotton as it now produces and at the same time produce about forty-five acres of other crops, thus raising their family income from about $140 to over $500.

It should be remarked that the principal benefit that will come from changes of this kind will not be a great increase in production; it will be a great increase in the income of the farm family, thus permitting a much higher standard of living. This may be said generally of the benefits to be derived from the application of

the principles of farm organization. It is easily seen that if one farm family who now manages twenty-five acres of land can be made to manage efficiently over fifty acres that one-half of the present farm population of the South will be sufficient to farm the present crop area. Increased efficiency in farm organization will thus tend to reduce rural population, but to increase greatly the income of those who remain. This will permit a larger proportion of the population to be employed in city industries. The increase in these industries will in turn broaden the market for farm products and thus justify increased production per acre on the land at present under cultivation, and this increased production must come about mainly in response to increased prices or decreased cost of production.

One of the strangest anomalies which has developed in our studies of farm organization is the fact that so-called accurate farm bookkeeping is exceedingly deceiving. The farmer who undertakes to keep books finds that the books do not tell him the truth, and he quits because he loses confidence in them. This point can be well illustrated in the case of farm poultry.

The office of farm management has, in some cases, kept an accurate record of all the labor, feed, supplies, etc., expended in maintaining a flock of poultry on the farm. In nearly all cases the results show that the poultry products have cost more than the farmer received for them. In one case a very efficient farmer in one of the North Central States, who maintained a large flock of poultry, found from an accurate record that the eggs during a certain year cost him twenty-five cents a dozen while the average selling price was twenty-two cents. The farmer did not know how to find where the trouble lay, but he did know that there was something wrong with the bookkeeping. When the results were shown him he remarked: "Well, I know I made these records accurately, and these eggs have cost me more than I got for them; but I couldn't buy eggs of the quality of those we have consumed on the farm this past year. I shall continue to keep my poultry." The trouble with the bookkeeping was this: this flock of poultry had been charged with about three hundred hours of labor at fifteen cents an hour. They had been charged with certain materials used in the construction of houses and runs and with the time consumed in putting these materials in place. They had been charged market prices for all

their feed, and so on. Now the fact is that nearly every hour of time spent on this poultry was time that would otherwise not have been profitably employed. Most of the material used in constructing and repairing the quarters was waste material lying about the place. A large part of the feed was material that, if the chickens had not been there, would have gone to waste. The fact is, this farmer made a profit out of his poultry, and the books did not represent the facts in the case.

It is even possible for a farmer to make a fair income when every industry on his farm, if considered separately by the usual methods of bookkeeping, would show a loss. Take the dairy farmers of New England, for instance. When we keep books against the average herd of dairy cows they show a loss, because we count the time put upon them at current rates of wages. But the fact is that many farmers, if they didn't have these cows, would spend most of the time for six months in the year with their feet against a hot stove. But with the cows to look after they can make enough above the actual cash expenditure to pay themselves, say seventy-five cents a day, all through this winter period. This represents just so much added to the farmer's income, and this industry, which the ordinary methods of bookkeeping show to be a losing one, is actually the foundation of the farmer's success, though it must be admitted that under such circumstances his success is rather meager.

It is impossible to approximate the annual saving to farmers in this country that would follow the adoption of ideal systems of organization for their farm business, for two reasons: in the first place, we do not know the facts concerning present conditions except for a few limited regions where farm management surveys have been conducted; and in the second place, such reorganization would require considerable change in the relative area of crops and in the numbers and types of farm animals, and no one can predict what the results of such changes would be. It is safe to say, however, that establishing suitable types of farming everywhere, making every farm either large enough or intensive enough (where permissible) to furnish full employment to its owner and the working members of his family, securing the largest yields consistent with profit, and introducing such organization of the farm business as to give the maximum utilization of the land, labor, and equipment of

the farmer, would have a most profound influence, not only on the standard of living on American farms, but on the supply of labor for other industries. The above-mentioned example of more than doubled output and income for a southern farm family is exceedingly suggestive.